

Remarks

Claims 1-28 and 42-43 are currently pending in the Application and Claims 42-43 are herein withdrawn without prejudice from consideration by the Examiner.

35 U.S.C. §102(b) rejection

Claims 1-4, 6-8, 10, 13-14, 16, 23 and 25 stand rejected under 35 U.S.C. §102(b) as being anticipated by Palmer (U.S. Patent No. 3,963,920). Applicants respectfully disagree.

The Examiner is reminded that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” MPEP 2131 quoting *Verdegaal Bros. V. Union Oil Co, of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The Examiner is also reminded that “[the] identical invention must be shown in as complete detail as is contained in the ... claim.” MPEP 2131 quoting *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Applicants submit that the Examiner has not shown that Palmer teaches each and every element as set forth in the rejected claims. In particular:

Claim 1

Applicants submit that the Examiner has not shown that Palmer discloses, suggests or teaches, *inter alia*, at least the following features recited by Claim 1 of the present application:

“optical wires are bonded onto said microchips and **optically connected** therewith ” (emphasis added)

The Examiner asserts that the “optical wires” as recited in Claim 1 are disclosed by Palmer’s “connector leads 33.” See page 2, section 2 of the Official Action.

In response to Applicants’ arguments, in the response dated May 24, 2005, that Palmer’s connector leads “33” are metal and therefore cannot be considered as

optical wires, the Examiner asserts that Palmer does not limit the leads to be only metal. See page 5, lines 2-8 of the Office Action. According to the Examiner, because Palmer discloses “glass/metal feedthrough,” Palmer discloses leads that can be glass. Applicants respectfully traverse the Examiner’s erroneous assertions.

Applicants respectfully bring to the Examiner’s attention U.S. Patent No. 6,788,873 issued to Fritz. According to Fritz, the “term ‘glass/metal feedthrough’ is generally understood in electronics and electrical engineering to be a vacuum-tight seal or fusion of glass to metal for passing an **electrical conductor or conductors** in an insulating fashion through a hermetically encapsulated housing” emphasis added). See column 4, lines 24-31 of Fritz enclosed herein.

Therefore, based on the generally understood definition of the term “glass/metal feedthrough” as stated in, *inter alia*, the U.S. Patent cited above, the glass/metal feedthrough disclosed in Palmer **cannot possibly be** the “optical wires” recited in Claim 1, as mistakenly asserted by the Examiner.

It is more likely that Palmer uses glass/metal feedthroughs to pass electrical connector leads “33” through the hermetically sealed enclosure “10.” See Figure 1 of Palmer. This is further supported by the fact that Palmer discloses using wire bond leads that connect leads “33” to the substrate “30.” See Figure 2 of Palmer. Applicants note that the wire bond leads connecting leads “33” to the substrate “30” are identical to wire bond leads “22” shown in Figure 2 of Palmer.

Therefore, Palmer does not teach, disclose or suggest that “optical wires are bonded onto said microchips and optically connected therewith” as recited in Claim 1 and Claim 1 is patentable over Palmer and should be allowed by the Examiner. Claims 2-4, 6-8, 10, 13-14, 16, 23 and 25, at least based on their dependency on Claim 1, are also believed to be patentable over Palmer.

35 U.S.C. §103(a) Rejection

Claims 5, 9, 11-12, 15, 17-22, 24 and 26-28 stand rejected under 35 U.S.C. §103(a) as being obvious in view of Palmer. Applicants submit that, at least for the reasons stated above, the Examiner has **not** established a *prima facie* case of obviousness for the claims rejected under 35 U.S.C. §103(a). Claims 5, 9, 11-12, 15, 17-22, 24 and 26-28, at least based on their dependency on Claim 1, are also believed to be patentable over Palmer. Applicants respectfully request that the rejection be withdrawn.

The Examiner is encouraged to contact the undersigned to discuss any other issues requiring resolution.

Conclusion


In view of the above, reconsideration and allowance of all the claims are respectfully solicited.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, then the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136 (a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

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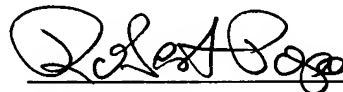
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Because of the features of the inventive method it is comparatively easy to provide a permanent hermetically sealed feedthrough device.

Additional features of preferred embodiments are set forth in the dependent claims appended hereinbelow.

In a particularly preferred embodiment the feedthrough sleeve is provided with a first axial section having a first interior diameter, which is filled with adhesive around the fiber optic light guide and the at least one protective layer is removed from only a portion of the fiber optic light guide in the first axial section. The feed through sleeve has a second axial section having a second interior diameter for receiving the half-cylinder-shaped pressed parts, this second interior diameter being greater than the first interior diameter.

In further preferred embodiments the Invar alloy consists of a Ni—Co—Fe alloy, a Fe—Ni—Cr alloy or a Fe—Ni alloy. Gold coating the feedthrough sleeve facilitates sealing the optical fiber light guide in it with the glass solder.

Advantageously the half-cylinder-shaped pressed parts are made with a process according to press/sinter technology. In this process the half-cylinder-shaped pressed parts of the composite-glass solder can be made from a lead-borate glass with an inert expansion-lowering filling material, especially β -Eucryptite. Alternatively, they can be made from a composite-glass solder consisting of a phosphate glass with an inert expansion-lowering filling material.

The local heating for local thermal sealing takes place by means of an electrically heated incandescent filament, inductively, by means of focussed infrared radiation or in an oven.

The hermetically sealed feedthrough device for hermetically sealing a fiber optic light guide according to the invention comprises a metallic feedthrough sleeve consisting of a metallic material, which comprises an invar alloy, and prefabricated half-cylinder-shaped pressed parts consisting of low-melting composite-glass solder, which have thermal expansion properties adapted to the metallic material of the feedthrough sleeve. A portion of the fiber optic light guide is sealed in this feedthrough device between these prefabricated half-cylinder-shaped pressed parts after removal of at least one protective layer or coating provided on this portion of the fiber optic light guide.

The low-melting composite-glass solder preferably has a thermal expansion coefficient of from 4.3 to 5 ppm/K and a processing temperature during sealing of under a Curie temperature of the invar alloy.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The objects, features and advantages of the invention will now be illustrated in more detail with the aid of the following description of the preferred embodiments, with reference to the accompanying figures in which:

FIG. 1 is a longitudinal cross-sectional view through a feedthrough sleeve with a fiber optic light guide sealed in it with glass solder, which has been made according to the method of the invention;

FIG. 2 is an exploded perspective view of some of the component parts of the hermetically sealed feedthrough device, which is shown in FIG. 1;

FIG. 3 is a longitudinal cross-sectional view of both axial sections of the feedthrough sleeve;

FIG. 4 is a perspective view of one prefabricated half-cylinder-shaped pressed part made of low-melting composite-glass solder with an axial groove, two of which are assembled in the feedthrough device shown in FIG. 1

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around the exposed or stripped optical fiber in respective grooves of the pressed parts; and

FIG. 5 is a cross-sectional view through a conventional fiber optic light guide with a glass core and a jacket and/or protective layer.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a longitudinal cross-sectional view of a preferred embodiment of a hermetically sealed feedthrough device for feeding a fiber optic light guide through a wall with a feedthrough sleeve made from a special metal alloy. The fiber optic light guide is fused and/or hermetically sealed in the feedthrough sleeve by means of a special solder glass. The metallic feedthrough sleeve itself is sealed in an opening through the wall (not shown) with known solder methods. The wall preferably comprises the same material as the feedthrough sleeve, so that no mechanical stresses develop because of different thermal expansion coefficients. This avoids endangering the permanence of the hermetic seal.

FIG. 2 is an exploded perspective view of component parts of the feedthrough device and/or hermetically sealed feedthrough according to FIG. 1, which are shown in detail separated from each other in FIGS. 3 to 5.

The hermetically sealed feedthrough device according to the invention generally is a glass/metal feedthrough. The term "glass/metal feedthrough" is generally understood in electronics and electrical engineering to be a vacuum-tight seal or fusion of glass to metal for passing an electrical conductor or conductors in an insulated fashion through a hermetically encapsulated housing. In the typical glass/metal feedthrough a prefabricated sintered glass part is fused in an outer metal part and one or more metallic inner conductors are fused or sealed in the glass part.

Because of differences in thermal expansion that exist between glass and metal it is unavoidable that mechanical stresses develop when they are fused together. In the so-called "adapted glass/metal feedthrough" one provides, for example, that stresses of this sort do not lead to weakening of the fused-together feedthrough device. For diathermic adaptation of a glass/metal seal the thermal expansion coefficients α of the glass and metal parts must largely correspond to each other or must agree between room temperature and the transformation temperature of the glass. Thus the mechanical stresses in the fused together assembly during the cooling of the feedthrough into the solidified range for the glass (viscosity range between 10^{13} and $10^{14.5}$ dPas) at room temperature do not exceed the strength limits permitted for glass. By selecting optimum fabrication conditions these glass/metal feedthroughs or feedthrough devices are practically stress-free at room temperature.

The methods and materials known for the adapted sealing together of electrical conductors are however not transferable (useable) in regard to the other materials and substantially reduced dimensions for sealing a fiber optic light guide in a metallic sleeve.

The conventional fiber optic light guide 1 shown in FIG. 5 is typical of modern glass fiber cable. This fiber optic light guide 1, also called an optical fiber guide, has a glass or optical fiber 2 with a typical outer diameter of 125 μm and a quartz glass core of 50 μm . An inner plastic protective layer 3 adheres to the glass fiber or optical 2. The fiber optic light guide 1 also has an outer removable plastic jacket 4, which forms an outer protective sleeve.

As shown especially in FIG. 1 the fiber optic light guide 1 is adapted to and sealed in a metallic feedthrough sleeve 5.